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## **INSPECTION OF CONSTRUCTION PROJECT SAMPLING AND TESTING**

### **PURPOSE**

The purpose of this memorandum is to prescribe general objectives, policies, procedures, and guide schedules for sampling and testing materials and construction. Sampling and testing guides for certain types of construction are attached as appendices to this memorandum.

### **OBJECTIVES**

The objectives of sampling and testing are:

- A. To determine through process control, verification and/or acceptance sampling and testing whether the construction operations controlled by sampling and testing and materials used or proposed for use in the construction work are in reasonably close conformity with approved plans and specifications (including approved changes).
- B. To provide checks or reliability of acceptance sampling and testing through independent assurance sampling and testing by personnel not normally responsible for process control or acceptance.
- C. To provide opportunity for timely remedial action when results of sampling and testing indicate materials used or proposed for use and the construction work accomplished or in progress are not in reasonably close conformity with the approved plans and specifications (including approved changes).

### **PROCESS CONTROL, VERIFICATION, AND/OR ACCEPTANCE SAMPLING AND TESTING**

Process control, verification, and/or acceptance sampling and testing are required to ascertain whether the quality of materials being incorporated into the construction and the quality of construction work in progress are in reasonably close conformity with the plans and specifications. Results of these tests constitute the principal means of determining daily if materials and construction are satisfactory, or whether corrective action should be taken before work proceeds further. They serve as the principal basis for determining the acceptability of completed construction.

### **Materials Inspection and Acceptance**

In order to provide the contractor the opportunity to construct a project with minimal sampling and testing delays, inspection is performed at the source. Source inspection may consist of inspecting process control, sampling for laboratory testing or a combination of these procedures. All source-inspected or certified materials are subject to inspection at the project site prior to being incorporated into the work. Project site inspections are for identification of materials with test reports and for any unusual alterations of the characteristics of the material due to handling or other causes. Supplemental monitor samples secured by project personnel of source-inspected, certified or project processed materials are also required for some materials in order to secure satisfactory evidence for acceptance.

## Source Inspection

Materials with characteristics, which do not easily change, will normally be accepted at the time of incorporation into the work on the basis of compliant source inspection test reports or certifications. This also applies to materials in which the packaging or form of shipment ensures proper identification of the materials and the original material characteristics.

Supplemental sampling and testing of source inspected material are required for some materials which are subject to change during delivery. This also applies to some materials, which are difficult to identify with source inspection test reports. Except for unusual situations, the contractor may, on the contractor's responsibility and at the contractor's risk, incorporate these materials into the work before completion of the required supplemental tests. Acceptance of these materials will be based on source inspection tests and tests of the supplemental samples.

In the case of aggregate quality, production from an approved source is required. The source approval includes the Quality Control operation and processing procedures established, and the ledges suitable for the production of crushed stone for the various quality requirements. Random source inspection is performed to detect any significant change in characteristics of a source and any variations of the established Quality Control and on processing procedures. Random sampling and testing is performed to monitor the quality of aggregate being produced from each source. For certain major types of construction, supplemental construction site verification and assurance sampling and laboratory testing for quality are required in addition to the above Quality Control inspection and testing prior to acceptance. The contractor may, on the contractor's responsibility and at the contractor's risk, incorporate these aggregates into the work before completion of supplemental tests. Acceptance for quality will be based on source monitoring and the test results on verification, assurance and/or project samples. Source approval and monitor inspections and tests will be the basis for acceptance of other aggregates.

Certified aggregate gradation tests by a certified aggregate technician in accordance with the requirements of Materials I.M. 209 and 210, are required by paragraph 1106.01 of the Standard Specification.

Certified source aggregate gradation tests will be considered advisory when the aggregate acceptance is determined by sampling and testing on the project in accordance with the appended sampling and testing guides. The advisory tested group is called **proportioned aggregate**. Source gradation tests may be considered the basis of acceptance for all other aggregates. The gradation tests are called certified gradation tests and the aggregates represented are called certified aggregates.

## Certification Procedures

In the case of many materials it is more economical, efficient, and practical to require certification procedures in lieu of source inspection. Certified test results are required for some materials and only a certificate of compliance is required for other materials. The acceptance of some proprietary materials is on an approved source or brand basis.

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For many of the materials for which certification procedures are required, supplemental testing of samples secured by contractor process control personnel or project monitoring personnel and verification and/or assurance samples secured by District personnel are also required as part of the basis of acceptance. When certification procedures are required, the contractor may, on the contractor's own responsibility and at the contractor's risk, incorporate these materials into the work. Acceptance will be based on satisfactory certification and compliance of the test results of any supplemental samples. When supplemental samples are not required, acceptance will be based on satisfactory certification.

The certificate of compliance shall be signed by an authorized representative of the company.

### **Small Quantities of Materials**

When small quantities of construction materials are involved and the cost of sampling and testing would be excessive, or the performance of the material is not critical, visual inspection or compliance certificates may be the basis for acceptance.

### **Sampling & Testing Guides**

The appended sampling & testing guides schedule indicates the minimum inspection, sampling and testing procedures required within the guide policy and procedures for the process control, acceptance, verification and assurance of materials and construction work. **NOTE:** There are two sets of sampling & testing guides - One in S.I. units (metric) and one in U.S. units (in./lb.).

## **PROJECT PLANT, FIELD LABORATORY AND GRADE INSPECTION AND ACCEPTANCE**

The project inspectors and/or the contractor process control technicians shall identify and inspect all materials received on the project before the materials are incorporated into the work. They shall ascertain that proper inspection reports or certifications are on hand and there have been no unusual alterations in the characteristics of the materials due to handling or other causes. In the event they are unable to properly identify the materials delivered or that materials were not inspected before delivery, the District Materials Office shall be notified. Project plant, field laboratory, and grade control sampling and/or testing shall be performed by the contractor process control personnel or the contract authority personnel as outlined in the sampling and testing guides and all other applicable instructions. When certified plant inspection or sampling and testing are provided by the contractor, those tests shall be known as process control tests. The acceptance testing will be the responsibility of the contract authority. With documented and satisfactory correlation test results, a contractor's process control test results may be used as acceptance. Test results determined by the District or Central laboratories, which indicate specification noncompliance, will be promptly reported to the project engineer office by telephone or Fax.

When certified plant inspection is required, the contractor's process control test results for aggregate gradation shall be the basis of acceptance. This acceptance will be dependent on satisfactory correlation with the contract authority's test results, in accordance with I.M. 216. The minimum frequency, for acceptance testing, shall be in accordance with I.M. 204.

Acceptance sampling and testing shall be performed by personnel that are certified by the Iowa

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Department of Transportation, Office of Materials. When contractor process control sampling and testing are used as part of the acceptance decision, the sampling and testing shall be performed in laboratories, and by personnel, that are qualified by the Iowa DOT Office of Materials. This will be accomplished by a certified technician training program, an independent assurance (IA) program, and by a satisfactory correlation program with regional and/or Central Materials laboratories.

A Non-compliance Notice (Form #830245) will be immediately delivered to the acting representative of the contractor for the area of construction involved whenever project or laboratory test results indicate noncompliance with the specifications and/or plans. Appropriate action in accordance with specifications and instructional memorandums shall be taken.

### **VERIFICATION AND ASSURANCE SAMPLING AND TESTING**

Independent verification sampling and testing will be performed to validate the quality of a material (e.g. freeze-thaw durability, abrasion, specific gravity, etc.) or a product (e.g. AC content, voids, density, smoothness, etc.). Those verification tests will be performed on the individual materials and/or the products considered to be the most critical and are identified in the attached guides. Independent assurance inspection will be performed as a check on the reliability of a material and the process control and acceptance sampling and testing. It is the responsibility of the District Materials Engineer to provide the verification and assurance inspection as outlined herein and designated in the sampling and testing guides. Personnel assigned to either of these activities shall be certified by the Iowa Department of Transportation, Office of Materials and not have any direct responsibility for project process control or acceptance sampling and testing.

Assurance samples of materials are required in some cases for testing to secure supplemental data for acceptance of source inspected or certified materials. The majority of the assurance samples are for validating process control and acceptance sampling and testing.

Verification and assurance sampling and testing shall be performed using test equipment other than that assigned to the project. Occasionally, for expedient situations, the project test equipment may be used. When specified in the appendices or when small quantities of materials are involved, the assurance sampling and testing may be accomplished by observation of the acceptance sampling and testing performed by contract authority personnel. When similar material is being incorporated into the work and processed through the same plant for more than one project, one verification or one assurance sample may be taken to represent those projects. Test results on the sample are to be reported to all projects represented by the sample.

Assurance Sampling and Testing for Incidental Concrete, as described in I.M. 528, is not required.

Assurance samples of materials for which project personnel are performing acceptance sampling and testing will normally be taken at approximately the same time and location as the project acceptance samples. Verification samples will be taken at random and will not be part of a split sample.

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Samples of other materials, which require laboratory testing, are to be taken in accordance with the sampling and testing guides and appropriate instructions.

A report of the assurance tests, and the companion project acceptance tests will be made by the individual performing the assurance tests. If there are any significant discrepancies between the test results, the report shall document the procedures used to evaluate and reconcile the differences and be signed by the District Materials Engineer. Generally, the report of the verification testing will be signed by the Central Laboratory Testing Engineer. The documentation to evaluate and reconcile any significant differences between process control and verification test results will be signed by the District Materials Engineer.

The frequency of assurance sampling should be increased when it appears that the average values of the test results are approaching either an upper or lower specification limit. If the test results on assurance samples, or verification samples, do not reflect the indicated quality of the material or if they are outside specification requirements, the District Materials Engineer should be consulted promptly concerning the cause, degree, and necessity for correction. Additional samples may be necessary to determine the cause of the deviations. Should there be any dispute over a discrepancy between contractor process control test results and verification or acceptance test results, the central office Materials Laboratory's test results will be considered as being the correct value.

The location, frequency, and responsibility for assurance and verification samples are designated in the attached sampling and testing guides.

It is not always possible to coordinate the assurance sampling from projects where small quantities of materials are incorporated in a short period of time. In such cases, assurance samples may be waived by the District Materials Engineer. However, assurance sampling is encouraged when possible. Quantities below which assurance samples are not required are shown in the appropriate appendixes.

The District Materials Engineer may opt to use a system basis for conducting the independent assurance responsibility. The frequency of sampling and testing will be based on quantity of production, a unit of time, or a combination of the two rather than a project basis. When a system basis is used, an annual report will be made to document the performance of the program.

### **SAMPLING AND TESTING GUIDE SCHEDULES**

The following guides prescribe the minimum frequency for sampling and testing, the indicated inspection locations and the size for each sample type. The guide frequencies are considered to be the minimum required for proper project documentation under normal construction conditions and procedures. More frequent sampling may be required by special conditions such as low or intermittent production, or widely varying test results, and must be initiated at the discretion of and by contractor process control and project inspection personnel. Test results reported via computer terminal may not be identified by a report form number.

**NOTE:** Currently only asphaltic concrete projects follow the Quality Control/Quality Assurance (QC/QA) guidelines. The sampling and testing frequencies are described, in detail, in the specifications for these Quality Management-Asphalt (QM-A) projects and are not included in the attached guides.

In order to maintain as much clarity as possible in the Guide Schedules, the changes from the last issue are not marked. The Schedules should be checked carefully for changes.

### **I.M. 204 Appendixes**

Appendix A	Roadway and Borrow Excavation and Embankments
Appendix B	Deleted
Appendix C	Modified Subbase
Appendix D	Granular Subbase
Appendix E	Portland Cement Conc. Pavement, Pavement Widening, Base Widening, Curb and Gutter & Class 1 Shoulders
Appendix F	Type A Asphaltic Concrete
Appendix G	Type B Asphalt Concrete, Type B Asphaltic Concrete Base Subbase and Base Widening
Appendix H	Structure Concrete, Reinforcement, Foundations & Substructures, Conc. Struct., Conc. Floors, & Conc. Box, Arch & Circular Culverts
Appendix I	Soil Aggregate Subbase
Appendix J	Soil Lime Subbase
Appendix K	Deleted
Appendix L	Granular Surfacing/Driveway Surfacing
Appendix M	Concrete Bridge Floor Repair & Overlay & Surfacing
Appendix P	Bituminous Seal Coat
Appendix Q	Deleted
Appendix R	Deleted
Appendix T	Base Repair 2212, Concrete Pavement Repair 2529 & 2530
Appendix U	Granular Shoulders
Appendix V	Subdrains